Exhibit 22

File History Report

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☐ **PTO 892**
☐ **PTO 948**
☐ **PTO 1449**
☐ **PTO 1474**
☐ **Assignment**

Additional comments
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60/456,413

Fan array fan section in air-handling systems

Transaction History

Date	Transaction Description
3/20/2003	Initial Exam Team nn
4/8/2003	IFW Scan & PACR Auto Security Review
5/27/2003	Application Is Now Complete
5/28/2003	Application Dispatched from OIPE
8/20/2004	EXPIRED PROVISIONAL

03 - 24 - 03 56413 .032603 APPROV

jc687 U.S. PTO
03/20/03

60/456413
03/20/03
U.S. PTO

PTO/SB/16 (10-01)
Approved for use through10/31/2002. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. EU122520178US

INVENTOR(S)

Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Lawrence G.	Hopkins	Portland, OR

☐ *Additional inventors are being named on the ______ separately numbered sheets attached hereto*

TITLE OF THE INVENTION (500 characters max)

FAN ARRAY FAN SECTION IN AIR-HANDLING SYSTEMS

Direct all correspondence to: **CORRESPONDENCE ADDRESS**

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ENCLOSED APPLICATION PARTS (*check all that apply*)

☒ Specification *Number of Pages* 11

☒ Drawing(s) *Number of Sheets* 6

☐ Application Data Sheet. See 37 CFR 1.76

☐ CD(s), Number

☒ Other (specify) Fee Transmittal (duplicate), Power of Attorney(s); Express Mail Certificate, Return Receipt Postcard

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

☒ Applicant claims small entity status. See 37 CFR 1.27.

☒ A check or money order is enclosed to cover the filing fees

☒ The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: 50-2115

☐ Payment by credit card. Form PTO-2038 is attached.

FILING FEE AMOUNT ($) 80.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: __________

Respectfully submitted,

SIGNATURE Karen Oster

TYPED or PRINTED NAME Karen Dana Oster

TELEPHONE (503) 810-2560

Date 3/20/03

REGISTRATION NO. *(if appropriate)* 37,621

Docket Number: Hunt:P:fanarr

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

This collection of information is required by 37 CFR 1.51. The information is used by the public to file (and by the PTO to process) a provisional application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the complete provisional application to the PTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, D.C. 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Box Provisional Application, Assistant Commissioner for Patents, Washington, D.C. 20231.

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Express No. EU122520178US

FAN ARRAY FAN SECTION IN AIR-HANDLING SYSTEMS

BACKGROUND OF INVENTION

The present invention is directed to a fan array fan section utilized in an air-handling system.

Air-handling systems have traditionally been used to cool large buildings or rooms (hereinafter referred to as "structures"). FIG. 1 shows an exemplary prior art air-handling system having a single fan unit housed in an air-handling compartment. For exemplary purposes, the fan unit is shown having an inlet cone, a fan, and a motor. Larger structures or structures requiring lower temperatures have generally needed a larger fan unit and a generally correspondingly larger air-handling compartment.

For example, a first exemplary structure requiring 50,000 cubic feet per minute of airflow at a temperature of 70 degrees Fahrenheit, would generally require a prior art fan section large enough to house a 55 inch impeller, a 60 horsepower motor, and supporting framework. The prior art fan section, in turn would need an air-handling compartment of approximately 89 inches high by 160 inches wide and 88 to 139 inches long. The minimum length of the air-handling compartment and/or airway path would be dictated by published manufacturers data for a given fan type, motor size, and application. The attached Cabinet Sizing Guides (see FIGS. 2-4) show exemplary rules for configuring a fan section. These rules are based on optimization, regulations, and experimentation.

For example, a second exemplary structure such as a recirculation air handler used in semiconductor and pharmaceutical clean rooms requiring 26,000 cubic feet per minute would generally require a prior art air-handling system with a fan section large enough to house a 44 inch impeller, a 25 horsepower motor, and supporting framework. The prior art fan section, in turn would need an air-handling compartment of approximately 84 inches high by 84

[redacted]

inches wide and 71 to 95 inches long. The minimum length of the air-handling compartment and/or airway path would be dictated by published manufacturers data for a given fan type, motor size and application. The attached Cabinet Sizing Guides (see FIGS. 2-4) show exemplary rules for configuring a fan section. These rules are based on optimization, regulations, and experimentation.

These prior art air-handling systems have many problems including the following exemplary problems:

- Because real estate (e.g. structure space) is extremely expensive, the larger size of the air-handling compartment is extremely undesirable.
- The single fan units are expensive to produce and are generally custom produced for each job.
- Single fan units are expensive to operate.
- Single fan units are inefficient in that they only have optimal or peak efficiency over a small portion of their operating range.
- If a single fan unit breaks down, there is no cooling at all.
- The low audio frequency of the large fan unit is hard to attenuate.
- The rotation of the large fan unit often causes undesirable vibration.

Height restrictions have necessitated the use of air-handling systems built with two fan units. It should be noted, however, that a good engineering practice is to design air handler cabinets and fan sections to be symmetrical to facilitate more uniform airflow across the width and height of the cabinet. Twin fans have been utilized where there is a height restriction and the unit is designed with a high aspect ratio to accommodate the desired flow rate.

[redacted]

Normally, the air handler and fan section is designed for a uniform velocity gradient of 500 feet per minute velocity in the direction of airflow. The two fan unit air-handling systems, however, still substantially suffered from the problems of the single unit embodiments. There was no recognition of advantages by increasing the number of fan units from one to two. Further, the two fan unit section exhibits a non uniform velocity gradient in the region following the fan which creates uneven airflow across filters, coils, and sound attenuators.

It should be noted that electrical devices have taken advantage of multiple fan cooling systems. For example, U.S. Patent No. 6,414,845 to Bonet uses a multiple-fan modular cooling component for installation in multiple component-bay electronic devices. Although some of the advantages realized in the Bonet system would be realized in the present system, there are significant differences. For example, the Bonet system is designed to facilitate electronic component cooling by directing the output from each fan to a specific device or area. The Bonet system would not work to direct airflow to all devices in the direction of general airflow.

BRIEF SUMMARY OF THE INVENTION

The present invention is directed to a fan array fan section within an air-handling system.

The foregoing and other objectives, features, and advantages of the invention will be more readily understood upon consideration of the following detailed description of the invention, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 is a side view of an exemplary prior art air-handling system having a single large fan unit within an air-handling compartment.

[redacted]

FIG. 2 is a prior art Cabinet Sizing Guide for Horizontal Direct Drive Plug Fans.

FIG. 3 is a prior art Cabinet Sizing Guide for Horizontal Belt Drive Plug Fans.

FIG. 4 is a prior art Cabinet Sizing Guide for DWDI Fan Section's Only (THD & BHD).

FIG. 5 is a side view of an exemplary fan array air-handling system of the present invention having a plurality of small fan units within an air-handling compartment.

FIG. 6 is a front view of the exemplary fan array air-handling system of the present invention having a plurality of small fan units within an air-handling compartment.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is directed to a fan array air-handling system. As shown in FIGS. 5 and 6, the fan array air-handling system uses a plurality of individual single fan units. In one preferred embodiment, the fan units are arranged in a true array, but alternative embodiments may include alternative arrangements such as in a spaced pattern, a checker board, rows slightly offset, or columns slightly offset (collectively referred to as an "array").

It should be noted that the plenum fan is the preferred fan unit of the present invention. The reason that plenum fans work best is that they do not produce points of high velocity such as those produced by axial fans and housed centrifugal fans. Alternative embodiments use known fan units or fan units yet to be developed that will not produce high velocity gradients in the direction of airflow. Still other embodiments, albeit less efficient, use fan units such as axial fans and centrifugal housed fans that have points of high velocity in the direction of airflow.

[redacted]

In the preferred embodiment each of the fan units in the fan array air-handling system is controlled by an array controller (not shown). In one preferred embodiment, the array controller may be programmed to operate the fan units at peak efficiency. In this peak efficiency embodiment, rather than running all of the fan units at a reduced efficiency, the array controller turns off certain fan units and runs the remaining fan units at peak efficiency. In an alternative embodiment, the fan units could all be run at the same level of operation.

Another advantage of the present invention is that the variable frequency drive (VFD) used for controlling fan speed and thus flow rate and pressure, could be sized for the actual operating power of the fan array air-handling system. Since the actual operating power of the fan array air-handling system is substantially less than the actual operating power of comparable prior art air-handling systems, the variable frequency drive's power could be reduced accordingly. The variable frequency drive could be sized to the actual power consumption of the fan array where as the variable frequency drive in a traditional design would be sized to the maximum nameplate rating of the motor per National Electrical Code requirements. An example of a prior art fan design supplying 50,000 cubic feet per minute of air at 2.5 inches pressure, would require a 40 horsepower motor and 40 horsepower variable frequency drive unit. The new invention will require an array of 1.5 horsepower motors and a 30 horsepower variable frequency drive.

This invention solves many of the problems of the prior art air-handling systems including, but not limited to real estate, reduced production costs, reduced operating expenses, increased efficiency, improved airflow uniformity, redundancy, sound attenuation advantages, and reduced vibration.

Controllability

In a 5x5 fan array for example, a building owner can select how many fans to operate. Each fan in a 5x5 array contributes 4% of the total air. In

[redacted]

variable air volume systems, which is what most buildings have, only the number of fans required to meet the demand would operate. A control system could be developed to take fans on and off line individually eliminating the need for a variable frequency drive. A further advantage to taking fans on and off line is where building control systems require low volumes of air at relatively high pressures. In this case, the fans could be modulated to produce a stable operating point and eliminate the surge effects that sometimes plague building owners and maintenance staff. The surge effect is where the system pressure is too high for the fan speed at a given volume and the fan has a tendency to go into stall.

Real Estate

The fan array air-handling system of the present invention preferably uses (60% to 80%) less real estate than prior art fan sections in air-handling systems. Comparing FIG. 1 with FIG. 5 shows a graphical representation of this shortening of the airway path. There are many reasons that using multiple smaller fans can reduce the length of the airway path. For example, reducing the size of the fan and motor reduces the length of the fan section. Similarly, reducing the size of the inlet cone reduces the length of the inlet plenum. The length of the fan section can also be reduced because air from the fan array air-handling system of the present invention is substantially uniform whereas the prior art air-handling system has points of higher pressure and needs time and space to mix so that the flow is uniform by the time it exits the air-handling compartment. (This can also be described as the higher static efficiency in that the present invention eliminates the need for settling means because there is little or no need to transition from high velocity to low velocity.) The fan array air-handling system takes in air from the inlet plenum more evenly and efficiently than the prior art air-handling system so that the length of the inlet plenum may be reduced.

[redacted]

For purposes of comparison, using the first exemplary structure set forth in the Background of the Invention (a structure requiring 50,000 cubic feet per minute of airflow at a temperature of 70 degrees F), an exemplary embodiment of the present invention could be served by a nominal fan section of 89 inches high by 160 inches wide and 88-139 inches long that could be housed in an air-handling compartment of approximately 89 inches high by 160 inches wide and 30 inches long (as compared to 88 to 139 inches long in the prior art embodiments). The fan section would include a 3 x 6 fan array air-handling system having 18 fan units. The space required for each exemplary fan unit would be a cube of approximately 24 to 30 inches on a side depending on the array configuration. The airway length is 30 inches (as compared to 88 to 139 inches in the prior art embodiments).

For purposes of comparison, using the second exemplary structure set forth in the Background of the Invention (a structure requiring 26,000 cubic feet per minute of airflow at a temperature of 70 degrees F), an exemplary embodiment of the present invention could be served by a nominal fan section of 84 inches high by 84 inches wide and 71-95 inches long that could be housed in an air-handling compartment of approximately 84 inches high by 84 inches wide and 30 inches long (as compared to 71 to 95 inches long in the prior art embodiments). The fan section would include a 3 x 3 fan array air-handling system having 9 fan units. The space required for each exemplary fan unit would be a cube of approximately 24 to 30 inches on a side depending on the array configuration. The airway length is 30 inches (as compared to 71 to 95 inches in the prior art embodiments).

Reduced Production Costs

Because the individual fan units of the fan array can be mass-produced, the fan array air-handling system of the present invention reduces production costs as compared to the single fan unit used in prior art air-handling systems. Whereas the prior art single fan units were generally custom built for

[redacted]

the particular purpose, the present invention could be implemented on a single type of fan unit. In alternative embodiments, there might be several fan units having different sizes and/or powers (both input and output). The different fan units could be used in a single air-handling system or each air-handling system would have only one type of fan unit.

In one preferred embodiment of the invention, the fan units are modular such that the system is "plug and play." Such modular units may be implemented by including structure for interlocking on the exterior of the fan units themselves. Alternatively, such modular units may be implemented by using separate structure for interlocking the fan units. In still another alternative embodiment, such modular units may be implemented by using a grid system into which the fan units may be placed.

Reduced Operating Expenses

The fan array air-handling system of the present invention preferably are less expensive to operate than prior art air-handling systems because of greater flexibility of control and fine tuning to the operating requirements of the building. Also, by using smaller higher speed fans that require less low frequency noise control and less static resistance to flow.

Increased Efficiency

The fan array air-handling system of the present invention preferably is more efficient than prior art air-handling systems because each small fan unit can run at peak efficiency. The system could turn individual fans on and off to prevent inefficient use of particular fan units. It should be noted that a array controller (not shown) could be used to control the fan units. As set forth above, the array controller turns off certain fan units and runs the remaining fan units at peak efficiency.

Redundancy

Multiple fan units add to the redundancy of the system. If a single fan unit breaks down, there will still be cooling. The array controller may take disabled fan units into consideration such that there is no noticeable depreciation in cooling or air flow rate. This feature may also be useful during maintenance as the array controller may target fan units that are to be maintained offline with no noticeable depreciation in cooling or airflow rate.

Sound Attenuation Advantages

The high audio frequency of the small fan units is easier to attenuate than the low audio frequency of the large fan unit. Less splitters or other noise control mechanisms are needed to attenuate the high audio frequency of the plurality of small fan units than the low audio frequency of the single large fan unit.

Reduced Vibration

The multiple fan units of the present invention have smaller wheels with lower mass and create less force thus causing less vibration than the large fan unit.

It should be noted that FIGS. 5 and 6 show a 4x6 fan array air-handling system having twenty-four fan units. It should be noted that the array may be of any size or dimension of more than two fan units. It should be noted that cooling coils (not shown) could be added to the system either upstream or downstream of the fan units. It should be noted that, although shown upstream from the fan units, the filter bank could be downstream.

The terms and expressions that have been employed in the foregoing specification are used as terms of description and not of limitation, and

[redacted]

are not intended to exclude equivalents of the features shown and described or portions of them. The scope of the invention is defined and limited only by the claims that follow.

[redacted]

WHAT IS CLAIMED IS:

1. A fan array air-handling system comprising:

(a) at least three fan units;

(b) said at least three fan units arranged in a fan array;

(c) an air-handling compartment within which said fan array of fan units is positioned; and

(d) an array controller for controlling said at least three fan units to run at peak efficiency.

2. The fan array air-handling system of claim 1, wherein said at least three fan units are plenum fans.

3. The fan array air-handling system of claim 1, wherein said air-handling compartment has an airway path, said airway path being less than 31 inches.

[redacted]

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POWER OF ATTORNEY OR AUTHORIZATION OF AGENT

Application Number	
Filing Date	3/20/2003
First Named Inventor	Hopkins
Title	FAN ARRAY FAN SECTION IN AIR-HANDLING SYSTEMS
Group Art Unit	
Examiner Name	
Attorney Docket Number	Hunt:P:fanarr

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[X] Practitioners at Customer Number 26790 → Place Customer Number Bar Code Label here

OR

[ ] Practitioner(s) named below:

Name	Registration Number

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Telephone		Fax			

I am the:

[X] Applicant/Inventor.

[ ] Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96).

SIGNATURE of Applicant or Assignee of Record

Name	Lawrence G. Hopkins
Signature	Lawrence G. Hop
Date	3/20/2003

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. *Submit multiple forms if more than one signature is required, see below*.*

[X] *Total of 2 forms are submitted.

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Application Number	
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Group Art Unit	
Examiner Name	
Attorney Docket Number	Hunt:P:fanarr

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Address					
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Country					
Telephone		Fax			

I am the:

[ ] Applicant/Inventor.

[X] Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96).

SIGNATURE of Applicant or Assignee of Record	
Name	Michael Post, Vice-President of HUNTAIR
Signature	Michael Post
Date	3/20/2003

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

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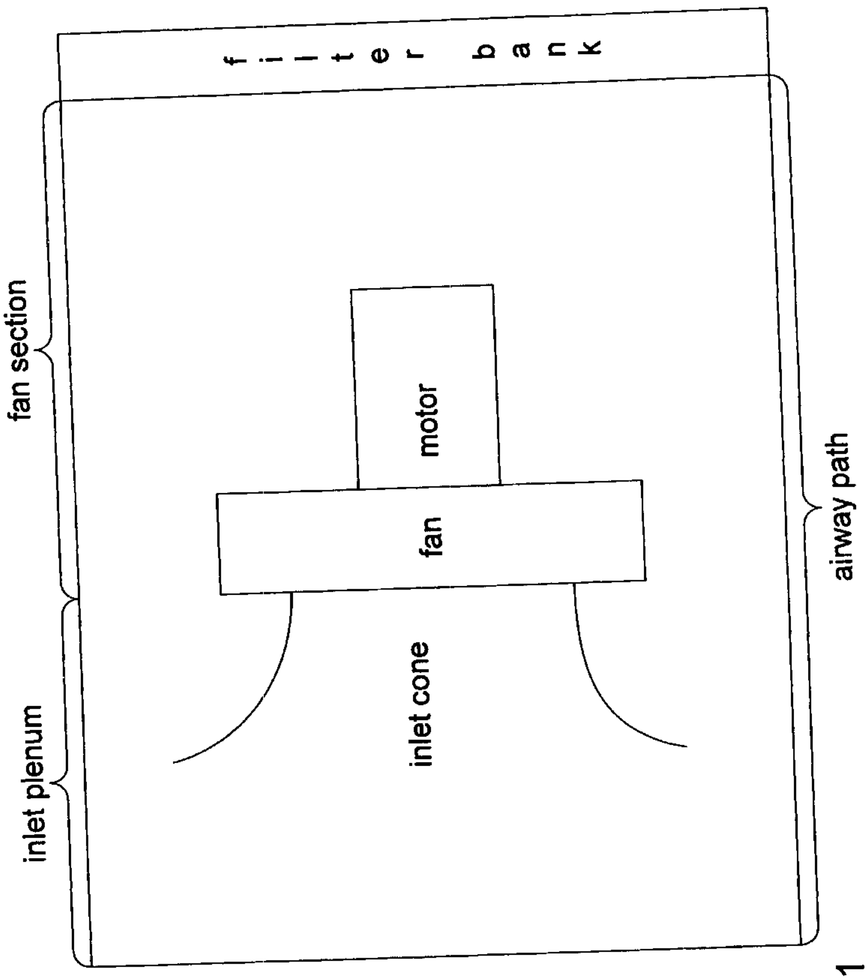
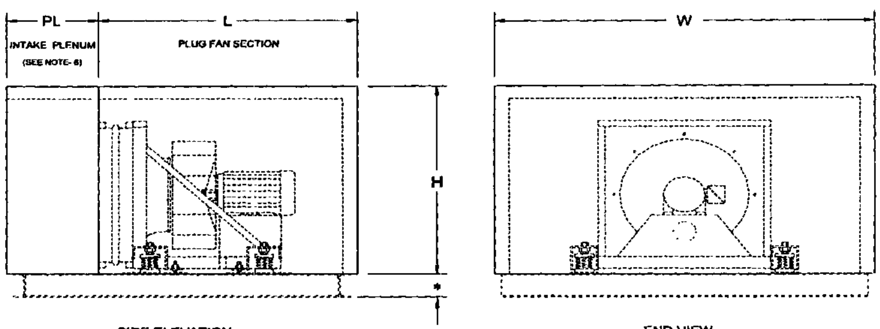


FIG. 1
(prior art)

HUNTAIR® *Commitment To Quality*

Cabinet Sizing Guide For Horizontal Direct Drive Plug Fans



SIDE ELEVATION

END VIEW

* ADD BASE CHANNEL HEIGHT TO CABINET HEIGHT (H)

FAN SIZE	CABINET DIMENSIONS BASED ON 2" INSULATION - 2 125" PANEL														PL = INLET PLENUM LENGTH		
	H	W	L = CABINET LENGTH BY MOTOR FRAME SIZE												Unit Casing Width Vs Plenum Length		
	HEIGHT	WIDTH	143/145	182/184	213/215	254/256	284/286	324/328	364/365	404/405	444/445	447/449	505/587	35 - 65	66 - 101	102 - 120
12	29	41	34	36	38									18		
14	35	47	35	37	39									18		
16	35	47	38	40	42	46								18		
18	35	47	36	40	43	47	49							18		
20	40	53		42	46	49	51							18	24	
22	40	53		43	47	50	53							20	24	
25	46	59			48	51	54	57						20	24	30
28	52	65			52	54	57	60						22	24	33
32	58	71				56	59	62	66						24	33
35	65	77				59	62	64	68						24	36
39	65	83					65	68	70	78					26	36
44	71	89						71	74	81	95				26	36
49	77	95							77	85	90	94			26	36
55	89	101								88	93	96	98		30	36
63	101	113								94	100	103	110			36
71	114	119									105	108	115			36

NOTES:

1. For 4" insulation add 2" to O.D. height and 4" to O.D. width.
2. " H " Dimension does not include base channel height. *(See sheet ENGR 2 for base channel sizing guide)*
3. For custom or larger cabinet sizing consult factory.
4. " L" Dimension includes end wall, deduct 2" without end wall
5. The minimum unit casing length is dependent on the required motor horsepower and or frame size
6. Intake plenum is required when fan is being used as draw-thru configuration preceded by a coil or filters in direction of air flow.
7. As part of our continuing program to improve the Design and Quality of our products, we reserve the right to make changes without notice or obligation.

FIG. 2

HUNTAIR, Inc.
Tigard, Oregon
(503) 639-0113
Fax (503) 639-1269

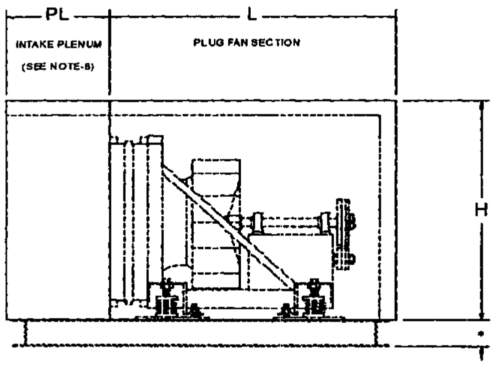
Rev. 10/28/98

Sheet CSA - 1

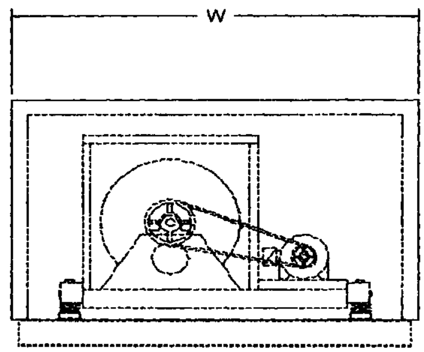
[redacted]

HUNTAIR® *Engineered Performance*

Cabinet Sizing Guide For Horizontal Belt Drive Plug Fans



SIDE ELEVATION



END ELEVATION

* ADD BASE CHANNEL HEIGHT TO CABINET HEIGHT (H)

FAN SIZE	CABINET DIMENSIONS BASED ON 2" INSULATION - 2.125" PANEL													PL = INLET PLENUM LENGTH			SHAFT DIAMETER	
	H	L	W = CABINET WIDTH BY MOTOR FRAME SIZE											Unit Casing Width Vs Plenum Length				
	HEIGHT	LENGTH	143/145	182/184	213/215	254/256	284/286	324/326	364/365	404/405	444/445	447/449	505/587	50 - 80	81 - 110	111 - 155	Class I, II	Class III
12	29	38	53	59	59									18			1.1875	N/A
14	35	44	59	59	65	65								18			1.1875	1 1875
16	35	45	59	59	65	65								18			1 1875	1 4375
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20	40	51	59	65	65	71	71							18	24		1.4375	1 6875
22	40	54		65	71	71	77	77						20	24		1.6875	2.1875
25	46	56		71	77	77	83	83						20	24		1.9375	2 1875
28	52	61			77	83	83	89	89					22	24	33	2.1875	2 1875
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39	65	74				95	101	101	107	107					26	36	2 4375	2.4375
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49	77	83					113	119	119	125	125				26	36	2 6875	2.6875
55	84	89						125	125	131	131	131			30	36	2.6875	2.9375
63	101	97							137	137	143	143	143			36	2 9375	3 4375
71	114	104							143	149	155	155	155			36	3.4375	3 4375

NOTES:

1. For 4" insulation add 2" to O.D. height and 4" to O.D. width.
2. " H " Dimension does not include base channel height. *(See sheet ENGR - 2 for base channel sizing guide)*
3. For custom or larger cabinet sizing consult factory.
4. " L " Dimension includes end wall, deduct 2" without end wall.
5. The minimum unit casing width is dependent on the required motor horsepower and or frame size.
6. Intake plenum is required when fan is being used as draw-thru configuration preceded by a coil or filters in direction of air flow.
7. As part of our continuing program to improve the Design and Quality of our products, we reserve the right to make changes without notice or obligation.

FIG. 3

HUNTAIR, Inc.
Tigard, Oregon
(503) 639-0113
Fax (503) 639-1269

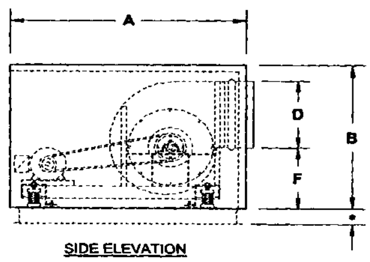
Rev. 6/15/98

Sheet CSA - 4

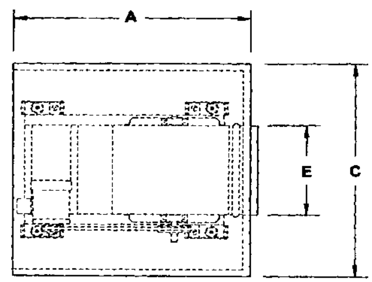
[redacted]

HUNTAIR® *World Leader In Air Flow Management*

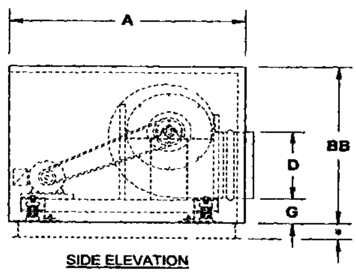
Cabinet Sizing Guide For DWDI Fan Section's Only (THD & BHD)



SIDE ELEVATION
TH DISCHARGE



PLAN VIEW



SIDE ELEVATION
BH DISCHARGE

* ADD BASE CHANNEL HEIGHT TO CABINET HEIGHT (B / BB)

FAN SIZE	CABINET DIMENSIONS BASED ON 2" INSULATION - 2 125" PANEL								MAX. MOTOR FRAME	SHAFT DIAMETER	
	A	B	BB	C	D	E	F	G	CLASS I, II	CLASS I	CLASS II
12	51	35	35	47	13.125	17.5	15.375	7.375	254T	1.1875	1.4375
13	53	40	40	47	14.5	19.625	16	7.25	254T	1.1875	1.6875
15	56	40	40	53	16	21.625	16 875	7 5	256T	1.4375	1.6875
16	61	46	46	59	17.625	23.75	17.625	7.375	284T	1.4375	1.9375
18	64	46	46	65	19.5	26.125	18.5	7.5	284T	1.6875	1.9375
20	67	46	52	71	21.375	28.625	19.5	7.625	286T	1.6875	2 1875
22	74	52	58	71	23.75	31.75	21.5	8.25	324T	1.9375	2.4375
24	78	58	58	77	26.125	35	22.75	8.125	326T	2.1875	2.4375
27	82	65	65	83	28.75	38.375	24.375	8.25	326T	2.1875	2.6875
30	91	65	71	89	32	42.875	26.75	7.75	364T	2.4375	2.4375
33	96	71	77	101	35.25	46.875	29	7.5	365T	2.4375	2.4375
36	108	77	83	107	38 875	52	31.75	8.625	405T	2.6875	2.6875
40	114	89	89	119	42.75	57.375	34.5	8.75	405T	2.4375	2.6875
44	124	95	101	131	47.25	63 25	37.75	8.75	445T	2.4375	2.9375
49	131	101	109	149	52.125	69.625	41.125	8.625	445T	2.6875	3.4375
54	139	109	114	161	57.5	77.125	45.125	8.75	445T	2.9375	3 4375

NOTES:

1. For 4" insulation add 2" to O.D. height and 4" to O.D. width.
2. "B" & "BB" Dimensions does not include base channel height. *(See sheet ENGR - 2 for base channel sizing guide)*
3. For custom or larger cabinet sizing consult factory.
4. As part of our continuing program to improve Design and Quality of our products, we reserve the right to make changes without notice or obligation.

FIG. 4

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10/27/97

Sheet CSA - 7

60456413.032003

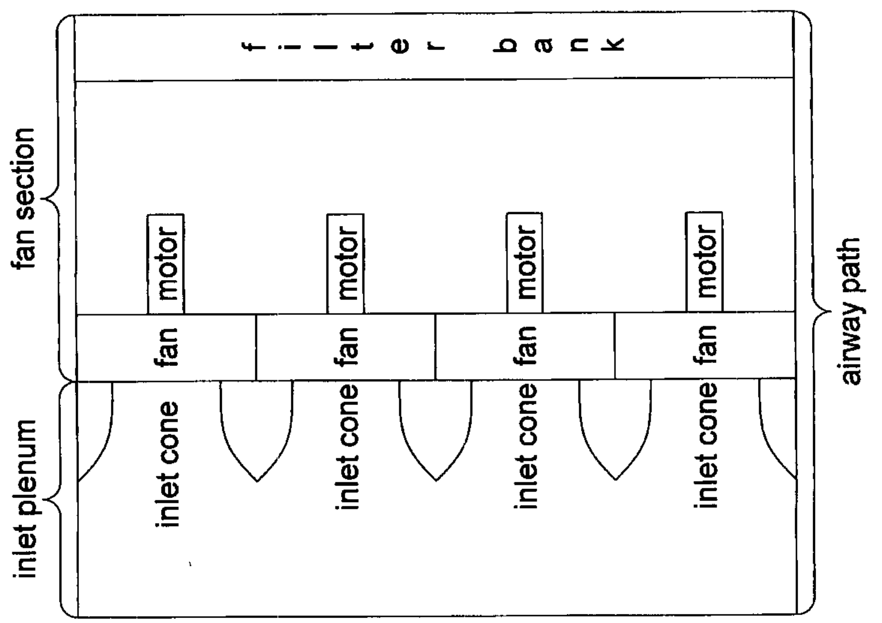

FIG. 5

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60456413.032003

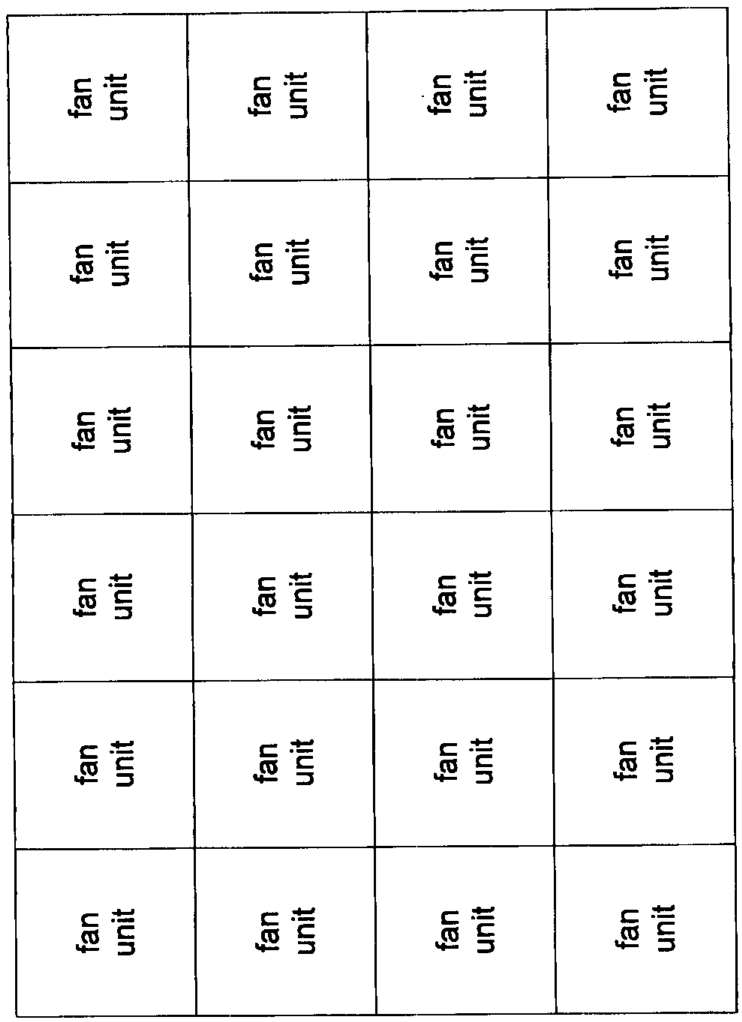

FIG. 6

[redacted]

60456413.032003

CERTIFICATE UNDER 37 CFR 1.10
CERTIFICATE OF MAILING BY
"EXPRESS MAIL"

Express Mail No.: EU122520178US
Date of Deposit: 3/20/03

I hereby certify that the following documents relating to a Provisional Patent Application entitled FAN ARRAY FAN SECTION IN AIR-HANDLING SYSTEMS and invented by Hopkins are being deposited with the United States Postal Service, "Express Mail Post Office to Addressee" service under 37 CFR 1.10, on the date indicated above and is addressed to Commissioner for Patents, Box Provisional Application, Washington, DC 20231.

- ☒ Patent Cover Sheet Form PTO/SB/16 (1 page(s))
- ☒ Specification (11 page(s))
- ☒ 6 sheets of drawings (FIGS. 1-6)
- ☒ Fee Transmittal Form
- ☒ A check for $ 80.00 for the provisional filing fee
- ☒ a return acknowledgement postcard
- ☒ this Certificate of Mailing by Express Mail
- ☐ ______________________

Karen Oster

Karen Dana Oster

Hunt:P:fanarr

[redacted]

60456413 .032003

PTO/SB/17 (01-03)
Approved for use through 04/30/2003. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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FEE TRANSMITTAL for FY 2003

Effective 01/01/2003. Patent fees are subject to annual revision

☑ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT	($)	80.00

Complete if Known

Application Number	
Filing Date	3/20/03
First Named Inventor	Hopkins
Examiner Name	
Art Unit	
Attorney Docket No.	Hunt:P:fanarr

METHOD OF PAYMENT *(check all that apply)*

☑ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☑ Deposit Account:

Deposit Account Number: 50-2115

Deposit Account Name:

The Commissioner is authorized to: *(check all that apply)*

☑ Charge fee(s) indicated below ☑ Credit any overpayments

☑ Charge any additional fee(s) during the pendency of this application

☐ Charge fee(s) indicated below, except for the filing fee

to the above-identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Fee ($)	Small Entity Fee Code	Fee ($)	Fee Description	Fee Paid
1001	750	2001	375	Utility filing fee	
1002	330	2002	165	Design filing fee	
1003	520	2003	260	Plant filing fee	
1004	750	2004	375	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	$80.00

SUBTOTAL (1) ($) 80.00

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

			Extra Claims		Fee from below		Fee Paid
Total Claims	20	-20** =	0	X	$9.00	=	$0.00
Independent Claims	3	- 3** =	0	X	$42	=	$0
Multiple Dependent						=	

Large Entity Fee Code	Fee ($)	Small Entity Fee Code	Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	84	2201	42	Independent claims in excess of 3
1203	280	2203	140	Multiple dependent claim, if not paid
1204	84	2204	42	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 0.00

***or number previously paid, if greater; For Reissues, see above*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Fee ($)	Small Entity Fee Code	Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	410	2252	205	Extension for reply within second month	
1253	930	2253	465	Extension for reply within third month	
1254	1,450	2254	725	Extension for reply within fourth month	
1255	1,970	2255	985	Extension for reply within fifth month	
1401	320	2401	160	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	
1403	280	2403	140	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,300	2453	650	Petition to revive - unintentional	
1501	1,300	2501	650	Utility issue fee (or reissue)	
1502	470	2502	235	Design issue fee	
1503	630	2503	315	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	750	2809	375	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	750	2810	375	For each additional invention to be examined (37 CFR 1.129(b))	
1801	750	2801	375	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) ____________

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 0.00

SUBMITTED BY				(Complete *(if applicable)*)	
Name (Print/Type)	Karen Dana Oster	*Registration No (Attorney/Agent)*	37,621	*Telephone*	(503) 810-2560
Signature	Karen Oster			*Date*	07/22/2002

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